

DrDAQ[®] Versatile data acquisition

Data logger, oscilloscope, signal generator and more!

Use the built-in sensors for light, sound, and temperature Measure pH using standard electrodes Add external sensors and digital devices Capture data from up to 20 DrDAQs on one PC USB connected and powered Free to download PicoLog 6 and PicoScope 6 software Free software development kit Example programs available to download Free technical support Free software updates Compatible with Windows, macOS and Linux

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www.picotech.com

Sensors and indicators

You can start using your DrDAQ Data Logger straight out of the box; it features built-in sensors for light, sound and temperature, and an RGB LED that you can program to show any one of 16.7 million colours. External sensor sockets also allow you extend the functionality of your DrDAQ. With external sensors your DrDAQ can measure humidity, oxygen levels, external temperatures and much more. Pico Technology provide you with Ground

everything you need to know to connect, use, and even design your own sensors.

More than just a data logger

Thanks to the versatility of your DrDAQ you can also use it as an oscilloscope and spectrum analyzer. Just download and run PicoScope software from <u>www.picotech.com/downloads</u> and your DrDAQ becomes a single-channel scope with a 100 kHz bandwidth, 8-bit resolution and the ability to measure voltages of up to ±10 volts.

Digital Input/Outputs

The DrDAQ includes 4 digital input/outputs. As inputs these give you even more monitoring options, and when used as outputs they enable you to use your DrDAQ to control external devices. Two of the digital I/Os include a pulse-counting function when used as inputs, and a pulse-width modulation (PWM) output capability.

But that's not all. Your DrDAQ also includes a signal generator which can be used as both a standard function generator and an arbitrary waveform generator (AWG). The AWG function enables you to create your own waveforms.



Hobbyist, student or professional: DrDAQ is all you need

The DrDAQ Data Logger has something for everyone: whether you're a teacher looking for a fun way to perform data logging experiments in the classroom, a student wanting an inexpensive introduction to data logging and oscilloscopes, a programmer who wants to use C++ to monitor and control the inputs and outputs of real-world devices, a hobbyist who wants to monitor and control their environment, or a professional wanting to measure pH under laboratory conditions – DrDAQ has everything you need.







Data logging and oscilloscope software

A PC-based data logger is only as good as its software – that's why the DrDAQ comes with a complete software package that enables you to use your DrDAQ not only as a data logger but also as an oscilloscope and arbitrary waveform generator. Pico Technology's PC-based programs are easy and intuitive to use and offer superior viewing quality, making them ideal for education and training. Data can easily be saved, printed, emailed, and exported to spreadsheets and databases.

Both PicoLog and PicoScope benefit from free upgrades, technical support, and international language versions, and are compatible with Windows, macOS and Linux.

PicoLog data logging software

PicoLog is a complete data acquisition software package for the Pico Technology DrDAQ data loggers. It provides a visual, easy-to-use interface for users to quickly set up simple or complex acquisitions and record, view and analyze data.



PicoScope is your complete test and measurement lab in a single application. Using the PicoScope software you can use your DrDAQ Data Logger as an oscilloscope or spectrum analyzer, and control the integrated signal generator, RGB LED, and digital outputs.

PicoSDK®

Pico's software development kit, PicoSDK, is available free of charge and allows you to write your own software and interface to third-party software packages.

Pico also maintains repositories of example code on GitHub (<u>github.com/picotech</u>), showing how to use PicoSDK with software packages such as Microsoft Excel, National Instruments LabVIEW and MathWorks MATLAB, or with programming languages including C, C++, C# and Visual Basic .NET.

PicoSDK and the *DrDAQ Programmer's Guide* are available to download from <u>www.picotech.com/downloads</u>.







PicoLog software

PicoLog is a complete data acquisition software package for the DrDAQ data logger, and is fully compatible with Windows, macOS and Linux. With its clear and user-friendly layout, ideal for use with a mouse or a touchscreen, PicoLog allows you to set up the logger and start recording with just a few clicks of the mouse, whatever your level of data logging experience. Set up simple or advanced acquisitions quickly, and record, view and analyze your data with ease.



Data view

Display all the data collected so far (**Show all data**) or keep the graph scale the same and pan along as new samples appear (**Follow new data**).

Pan and zoom controls

Zoom in, zoom out, zoom to a selection or pan through the data with these tools. If you make a mistake, just click **Undo zoom**.

Cursors and annotations

Use **Cursor** to highlight the data value and time at any point on the graph, then click **Add annotation** to mark that point with a text note.



Math channels

Sometimes you need to use data from one or more measurement channels to graph and record a calculated parameter. You can use the PicoLog equation editor to set up simple math channels such as A–B or more complex functions such as log, sqrt, abs, round, min, max, mean and median.

PicoLog treats math channels like any other channel, so you can still set alarms and annotate them.

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Alarms

In PicoLog, you can set up alarms to alert you to various events. These can be as simple or as complex as you like: alarms can trigger on a signal threshold or disconnection of the data logger, or you can set up a logic expression of your own. Alarms can play sounds, display visual alerts, run applications or mark when the event occurred on the graph.

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Intuitive logger and channel setup

The **Devices** view lets you set up a multichannel acquisition system in a simple way, with the option to use multiple different Pico data loggers simultaneously. PicoLog shows you an image of each connected device, so you can quickly and easily enable or disable channels and set up their properties.

On the right, you can see the device setup for the acquisition of data from a DrDAQ and one TC-08 temperature data logger.



Robust file format

At the heart of PicoLog is the file system, which stores live capture data directly to a robust database, rather than to a single file that is vulnerable to corruption and data loss. If the computer is shut down and rebooted, PicoLog will only lose the data during the outage – saving resumes when you restart the software.

This file system also means that the size of the dataset you can capture you is virtually unlimited – the only restriction is the size of your computer's hard disk!

The .picolog file format is compatible across all operating systems, and there is no need to set up a file to save to before the capture is complete. You can also save mid-capture if you wish to share the data collected so far. Since anyone can download and install PicoLog for free, you can easily share saved data with co-workers, customers and suppliers for offline post-analysis.

Data can be exported as CSV. In addition, you can export a PDF containing a graph, channel configuration, capture notes, annotation notes and alarm trigger history.

PicoSDK®

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Pico also maintains repositories of example code on GitHub (<u>github.com/picotech</u>), showing how to use PicoSDK with software packages such as Microsoft Excel, National Instruments LabVIEW and MathWorks MATLAB, or with programming languages including C, C++, C# and Visual Basic .NET.

PicoSDK and the *DrDAQ Programmer's Guide* are available to download from <u>www.picotech.com/downloads</u>.

Try the PicoLog software today!



PicoLog's built-in demo mode allows you to try out the full functionality of the software with a choice of virtual devices and simulated live data. You also can use PicoLog to view previously saved data, even with no device connected. Visit <u>www.picotech.com/downloads</u> and select **PicoLog Data Loggers** to get your copy.

Specifications

| Number of channels | 14 |
|---|--|
| Maximum sampling rates: | |
| Block mode (PicoScope and PicoSDK) | 1 MS/s ^[1] |
| USB streaming (PicoScope) | 1 kS/s ^[2] |
| USB streaming (PicoSDK) | 100 kS/s ¹³ |
| PicoLog maximum USB streaming rate | 1 kS/s |
| Memory depth (block mode) | 16 320 samples at 1 MS/s, 1 000 000 samples at slower rates ^[3] |
| Memory depth (USB streaming) | |
| PicoScope | 1 MS |
| | |
| ¹¹ Single channel only. ¹² Per active chann | iel. ¹⁰ Shared between active channels. |
| Oscilloscope/spectrum analyzer channel | |
| Bandwidtn | |
| Resolution | |
| Input Impedance | I MΩ Cingle and d DNO(f) compactor |
| Input type | Single-ended, BINC(T) connector |
| Input coupling | |
| Input ranges (Iuli scale) | ±1.25 V, ±2.5 V, ±5 V, ±10 V |
| | |
| | |
| Function generator/arbitrary waveform | generator (AwG) output |
| Channels | |
| Connector | BNC |
| Standard waveforms | Sine, square, triangle, ramp (up/down), DC level |
| Function generator frequency range | DC to 20 kHz |
| Signal amplitude | 0 to 1.5 V in 2 mV steps |
| Signal offset | ±1.5 V in 2 mV steps |
| Accuracy | ±10 mV |
| AWG frequency range | DC to 100 kHz |
| AWG buffer size | 4096 samples |
| AWG update rate | 2 MS/s (maximum) |
| AWG resolution | 10 bits |

| Built-in sensors/outputs | | | | |
|-------------------------------------|--|---|----------------|-------------------------------|
| Channel | | Range | Resolution | Accuracy |
| Sound waveform | | ±100 | ±0.2 | not calibrated |
| Sound level | | 55 to 100 dB | 1 dB | 5 dB |
| Temperature | | –10 to +70 °C | 0.1 °C @ 25 °C | 2 °C @ 25 °C |
| Light | | 0 to 100 | 0.1 | not calibrated |
| RGB LED | | 16.7 million colours | 8 bit x 3 | not applicable |
| Analog inputs | | | | |
| Туре | Connector | Range | Resolution | Accuracy |
| рН | BNC | 0 to 14 pH | 0.02 pH | Depends on sensor calibration |
| Redox/ORP | BNC (shared with pH) | ±2000 mV @ 1 TΩ | 1.2 mV | Depends on sensor calibration |
| Resistance | Screw terminal | 0 to 1 MΩ | 250 Ω @ 10 k | 5% |
| External sensors | 3 x FCC68 4/4 | Measure 0 to 2.5 V (Also supply power to external sensors and identify sensor type via ID resistor.) | 1 mV | 1% |
| Configurable digital IO | | | | |
| Channels | 4 | | | |
| Connector type | Screw terminals | | | |
| Input characteristics | 0 to 5 V (Low:0 to 0.8 V, High: 2 to 5.5 V) TTL compatible | | | |
| Output characteristics | 3.3 V, 2.2 kΩ output impedance | | | |
| PWM output Period Pulse width | Available on 2 Digital IO channels <65535 µs ≥1 µs | | | |
| Pulse counting Range | Available on 2 Digital IO channels Up to 65535 counts @ 500 kHz | | | |

| Software | | | |
|---|--|--|--|
| PicoLog, PicoScope and PicoSDK | Available from www.picotech.com/downloads | | |
| icoSDK example code Available from Pico's GitHub organization page, <u>github.com/picotech</u> | | | |
| PicoLog user interface languages English, French, Italian, German, Spanish, Korean, Japanese, Chinese (simplified), Russian | | | |
| PicoScope user interface languages | Chinese (simplified), Chinese (traditional), Czech, Danish, Dutch, English, Finnish, French, German, Greek, Hungarian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Romanian, Russian, Spanish, Swedish, Turkish | | |
| PC requirements | | | |
| Picol og | Microsoft Windows 7, 8 or 10, 32-bit and 64-bit versions, macOS 10,9 (Mayericks) or later 64-bit only Linux*, 64-bit only | | |
| FICOLOG | Hardware requirements as operating system. * PicoLog for Linux is distributed as an AppImage, so you can install it without superuser permissions: see <u>appimage.org</u> for further information. The software has been tested on OpenSUSE and Ubuntu. | | |
| PicoScope ^[4] | PicoScope Stable: Windows 7, 8 or 10 (32 or 64-bit). PicoScope Beta: macOS 10.9 (Mavericks) or later, 64-bit only, Linux (OpenSUSE and Ubuntu). Hardware requirements as operating system. | | |
| PicoSDK ^[4] | Only available for Windows. Drivers also available for 64-bit Linux and macOS. | | |
| PC interface USB 2.0 full speed (USB 1.1 and USB 3.1 compatible) | | | |
| ^[4] PicoScope R6.11 and PicoSDK 10.6.11 versions above. | are the last versions compatible with Microsoft Windows XP (SP3) and Vista SP2, and they are also compatible with the Windows | | |
| Environmental | | | |
| Operating temperature | 0 to 70 °C (20 to 30 °C for stated accuracy) | | |
| Storage temperature | -20 to +80 °C | | |
| Operating humidity | 5 to 80 %RH, non-condensing | | |
| Storage humidity | 0 to 95 %RH, non-condensing | | |
| General | | | |
| Additional hardware (supplied) | USB 2.0 cable and user manuals | | |
| Input overvoltage protection | ±30 V | | |
| Power requirements | Powered from USB port | | |
| Dimensions | 77 x 70 x 23 mm (approx 3 x 2.7 x 0.9 in) (includes BNC connectors) | | |
| Weight | 60 g (approx 2.1 oz) | | |
| Compliance | European EMC and LVD standards FCC Rules Part 15 Class A RoHS compliant | | |
| Warranty | 5 years | | |

External sensors and probes

As well as the built-in sensors, DrDAQ has sockets for optional external sensors. When a sensor is plugged in the software detects it and will automatically scale the readings. For example, when a temperature sensor is plugged in the readings are displayed in °C, and for a humidity sensor the readings are displayed in % RH.

DD100 Temperature Sensor

A high-accuracy general purpose temperature sensor with a 2 metre lead. Suitable for air, surface, or liquid measurements.



PP214 Oxygen Sensor



| Range | -10 to +105 °C (14 to 221°F) |
|----------------------|------------------------------|
| Resolution (at 25°C) | 0.1 °C (0.18 °F) |
| Accuracy (at 25°C) | 0.3 °C (0.54 °F) |

DD011 DrDAQ pH sensor

A robust epoxy-bodied pH electrode ideal for educational use. The pH sensor consists of a standard electrode capable of measuring the full 0 to 14 pH range, and comes complete with a small bottle of storage solution to help prevent it from drying out.

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| Size | 12 x 120 mm |
|-----------------------|---------------------------|
| Operating temperature | 0 to 60 °C (32 to 140 °F) |
| Resolution | 0.02 pH |

PP163 DrDAQ humidity sensor

A sensor which measures humidity using a 'non-condensing' technique. It has a short response time and plugs into the external sensor connections of the DrDAQ.



| Size | 72 x 45 x 28 mm |
|-----------------------|---------------------------------------|
| Operating range | 20 to 90 %RH |
| Overall accuracy | Reading ± 10% |
| Operating temperature | 0 to 60 °C (32 to +140 °F) |
| Resolution | 0.2 %RH |
| Minimum response time | 60 seconds with vigorous air movement |
| Maximum response time | 60 minutes in still air |
| | |

A sensor which can be used to measure the percentage of oxygen in a gas.

| Sensor type | Galvanic Cell (lead-oxygen with weak acid electrolyte) |
|-----------------------|--|
| Input range | 0 to 100% oxygen |
| Accuracy (calibrated) | ±3.0% over operating conditions range |
| Response times | < 15 seconds for 90% response < 25 seconds for 97% response |
| Humidity | 0 to 95% Non-condensing |
| Operating temperature | 5 to 40 °C (41 to 104 °F) |
| Storage temperature | -15 to 50 °C (5 to 122 °F) |

TA375 Passive oscilloscope probe

Our ergonomically designed passive oscilloscope probe with switchable 1:1 or 10:1 attenuation is suitable for use with any oscilloscope with a 1 M Ω input and 10 to 35 pF capacitance range as well as the PicoScope range of USB Oscilloscopes. Passive probes don't require a power supply or batteries so are lightweight and easily portable.



| | x1 | x10 |
|----------------------|---------------------------|---------------|
| Attenuation | 1:1 | 10:1 |
| Bandwidth | DC to 10 MHz | DC to 100 MHz |
| Rise time | 35 ns | 3.5 ns |
| Input resistance | 1 MΩ | 10 MΩ ± 2% |
| Input capacitance | 57 pF + C _S ** | 15 pF |
| Cable length | 1.2 m r | nominal |
| ** scope capacitance | | |

PP066 DrDAQ reed switch

The reed switch sensor can be used to detect the presence of a magnetic field such as from a bar magnet or an electromagnet. Alternatively, a simple external switch can be wired to the internal screw terminals. It has a fast response time of 2 ms so can be used as an alternative to a light gate

for timing applications. Other uses include monitoring the amount of time a door is left open or a machine running.

PP216 magnetic induction kit

The Magnetic Induction Kit can be used to demonstrate electromagnetic induction, the direction of induced currents and variation of the size of induced EMF with velocity. It can also be used as a student-based investigation, either with full instructions or as an open investigation where the students research the concepts.

Available kits and contents

The DrDAQ is available as a single unit or as part of a kit, as detailed below:

PP706 DrDAQ

- DrDAQ
- USB installation guide
- Cable: USB 2.0 1.8 m blue

PP716 DrDAQ pH logging kit

- DrDAQ
- pH electrode
- DrDAQ 2 m temperature sensor
- USB installation guide
- Cable: USB 2.0 1.8 m blue

PP707 DrDAQ Data logging kit

- DrDAQ
- pH electrode
- 2 DrDAQ 2 m temperature sensors
- DrDAQ humidity sensor
- USB installation guide
- 3 m sensor extension cable
- Scope probe x1/x10 switchable
- Cable: USB 2.0 1.8 m blue



The DrDAQ redox sensor (also known as an ORP sensor) can measure redox potential in the range of -1500 mV to +1500 mV. Positive readings indicate an increase in oxidation state (loss of electrons), while negative readings indicate a reduction in the oxidation state (gain of electrons).



| Size | 12 x 160 mm |
|---------------------|------------------------------|
| Measuring range | ±1500 mV |
| Junction | Ceramic |
| Reference cell | Ag/AgCl, KCl gel |
| Sensitive component | Dia.6 x 2.5 mm platinum ring |
| Plug | BNC with 1 meter cable |





Ordering information

| Product name | Description |
|-----------------------|--|
| DrDAQ | USB connected data logger, oscilloscope, signal generator and more, with built-in sensors. |
| DrDAQ pH logger kit | Includes the standard pH electrode for measuring and data logging over the full pH range. |
| DrDAQ data logger kit | Includes one scope probe, two temperature sensors and one humidity sensor for additional measurements. |



Optional accessories

| Product name | Description |
|--|--|
| DD100 DrDAQ temperature sensor | High-accuracy general-purpose thermistor temperature sensor with a two-meter lead. |
| DD011 DrDAQ pH sensor | Epoxy-bodied standard electrode capable of measuring the full 0 to 14 pH range. |
| PP163 DrDAQ humidity sensor | Non-condensing humidity sensor with a short response time. |
| PP214 DrDAQ oxygen sensor | Measures the percentage of oxygen in a gas. |
| TA137 DrDAQ redox sensor | Measure redox potential in the range of -1500 mV to $+1500$ mV. |
| PP066 DrDAQ reed switch | Detect the presence of a magnetic field such as from a bar magnet or an electromagnet. |
| EL032 DrDAQ sensor extension cable, 3 m | Replacement 3 meter (about 10 ft) sensor cable for DrDAQ sensors. |
| PP216 Magnetic induction kit | The Kit provides a simple and effective method for students to investigate the concepts of Faraday's laws. |
| TA375 Passive oscilloscope probe | Passive oscilloscope probe: 100 MHz bandwidth 1:1/10:1 switchable, BNC |
| DD010 "Datalogging in Practice" by Roger Frost | This 142 page book contains a huge number of experiment ideas for teachers. |
| MI106 USB 2.0 cable, 1.8 m** | Replacement Pico blue USB 2.0 cable, 1.8 m |
| TA268 USB 2.0 cable, 0.5 m** | Pico blue USB 2.0 cable, 0.5 m |

* Prices correct at the time of publication. Sales taxes not included. Please check <u>www.picotech.com</u> for the latest prices before ordering.

** Pico blue USB cables are designed and built specifically for use with Pico Technology oscilloscopes and data loggers in order to minimize voltage drop and noise. Take care to use your DrDAQ with Pico blue USB cables only.

DrDAQ science experiments

Our website has a number of suggested scientific experiments using the DrDAQ. The example below uses the addition of a pH probe to test the pH level of a range of common drinks.

Example experiment

Dentists always warn about the dangers of drinking acidic drinks. Teenagers, they suggest, who drink large amounts suffer from tooth erosion whereby the enamel covering of the tooth is dissolved by the acid in the drink. Athletes are also at risk from drinking sports drinks.

The recommended 'safe' pH level for drinks is 5.5, and anything below this can promote tooth erosion. This experiment looks at the relative pH values of different drinks and can be used to determine whether a particular drink is 'safe' according to the above criteria. It can also be used as a good introduction to further studies into tooth decay and enamel stripping.

This experiment is suitable for ages 14+ and requires some knowledge of the pH measurement.

For further information on this experiment, please visit: picotech.com/library/experiment/ph-level-drinks-drdag.

For the full list of experiments, please visit: picotech.com/library/experiments.

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| Dico | Home Pro | ducts Dowr | iloads Foru | ım Support | Library News | Al |
| / Library / Educational experiments / Testing th | e pH level of common dr | inks using DrDAQ as a | pH meter / Results | | | |
| rDAQ ata logger, oscilloscope, signal enerator and more! | Testing a pH m | the pH lev eter: result | rel of comi S a the average of a poll | mon drinks | e experiment was carried out. | IS |
| and address of the same | Liquid | Expected pH | Recorded pH | | | |
| Contraction of the second | Milk | 8 | 6.76 | | | |
| CE ALERICE | Lemon squas | n 4.5 | 3.56 | | | |
| Calebr | Ribena | 5 | 3.19 | | | |
| 130 | Cherry Coke | 3 | 2.17 | | | |
| | Pepsi | 3 | 2.63 | | | |
| DAD is a versatile instrument that connects to the | Original Coke | 2.5 | 2.61 | | | |
| SB port of any PC. Using the supplied PicoScope | Black coffee | 7.5 | 5.51 | | | |
| iftware it can be used as an oscilloscope, spectrum alyzer and signal generator. | Black tea | 7.5 | 6.37 | | | |
| inst £100 | Lemon tea | 5 | 3.73 | | | |
| rom just ~ 109 | Apple juice | 3.5 | 3.49 | | | |
| More > | Orange juice | 4 | 3.84 | | | |



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